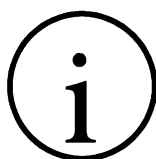




USER MANUAL

**DRILLING MACHINE
FOR UNDER PRESSURE MAINS
MODEL *AcuDrill***

Revision No. 3 - November 2010
Publication: MU-41-14E



NOTES !

The modifications carried out against the previous revision of this publication are indicated with ¶ on the right margin.

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SECTION 1: INTRODUCTION

1.1 INTRODUCTION

The *AcuDrill* drilling machine is especially designed to drill on mains, under pressure or pressureless, on any type of material: gray-iron casting, ductile casting, PVC, PE, PP, asbestos cement, polyester, clay, steel, etc. It is especially designed to be used on branch connections or threaded accessories.

The machine dome is connected to the threaded outlets of saddles through threaded adapters. The sizes of the available adapters are 3/4", 1", 1 1/4", 1 1/2" and 2" BSP. It allows holes of up to 48 mm diameter to be drilled, using standard hole saws of high-speed steel or tungsten carbide tipped hole saws with coupon retainer-equipped pilot drill. The chuckshaft can be fixed in three different positions according to the position of the accessories to be drilled.

It can be operated manually by means of a ratchet wrench provided with a revolving handle, although it is designed to be used through a swivel gear with either an electric or pneumatic actuator.

For drilling mains under pressure, the maximum allowable pressure is 16 bar (for water mains) and 5 bar (for gas mains).

The machine is equipped with an absorbing mechanism that ensures a soft and regular operation system of the drill and hole saw over the tube during drilling, absorbing excessive feed that could lead to blocking of the hole saw, allowing continuous drilling.

The set includes a dome with built-in spindle, a machine body, chuckshaft, two arbor hole saws with pilot drill (with coupon retainer system), a spanner for the dome adapters, a 3 mm Allen key, a 1/2" ratchet wrench with revolving handle, in addition to a carrying case and *User Manual*.

The technical information provided in this *Manual* is purely informative, and subject to change without prior notification. ACUSTER, SL. shall not be responsible for any claims derived from misuse of this publication or any errors and/or omissions that could be detected in it following its publication.

1.2 GENERAL INFORMATION

The development, documentation, production, testing and shipping of the products described have been performed:

- in compliance with the applicable safety rules, and
- in accordance with the Acuster, SL. quality assurance requirements.



WARNING !

Only qualified personnel are authorized to perform drilling work with the *AcuDrill* drilling machine. Qualified personnel must be familiar with all safety measures, potential hazards and maintenance rules described in this *Manual*.

The safe usage of the products described herein requires appropriate transport, storage, installation and use, careful treatment and compliance with the pre-established regular maintenance.

1.3 "CE" DECLARATION OF CONFORMITY

ACUSTER, S.L.
 Juan de la Cierva, 1
 Polígono Industrial Nº 1
 08960 Sant Just Desvern

we declare, under our sole responsibility that the **AcuDrill** drilling machine has been manufactured in compliance with the following specifications:

| Directive | Related specification | Model |
|---|----------------------------------|-----------------|
| 2006/42/CE <i>Machine safety Directive</i> | EN-ISO 12100-1 EN-ISO 12100-2 | <i>AcuDrill</i> |

Sant Just Desvern, 13th May 2005



Ramon García Solé

1.4 GUARANTEE

Guarantee declaration:

All *AcuDrill* drilling machines are manufactured from high quality material and have been subjected to rigorous tests for resistance and working order as well as passing all the quality control tests required by the applicable normative (see "CE" Declaration of conformity).

Regardless of whether an incident might occur during the period of guarantee, we recommend a careful reading of the following general guarantee conditions.

General conditions of Guarantee:

1. ACUSTER S.L. guarantees that this product has no manufacturing defect at the time of its purchase and extends this guarantee for the period of TWO years.
2. If the product proves defective during this period, due to the materials or its assembly, it will be repaired free of charge, including the cost of materials and labour at Acuster, S.L.'s Technical Service.
3. The Guarantee is not valid in the following cases:

When the fault in the product is a result of:
 - Usual wear and tear due to usage.
 - Abuse or incorrect use of the unit
 - Repairs carried out without authority from Acuster, S.L..
 - Accidents, natural disasters (including lightning, water action etc) as well as any cause beyond Acuster, S.L.'s control.
4. In all claims against this guarantee, information relating to the model, date of purchase, Serial number and any other additional information must at all times be stated.

SECTION 2: MACHINE DESCRIPTION

2.1 COMPONENTS OF THE DRILLING MACHINE

The *AcuDrill* drilling machine assembly is made of the following components:

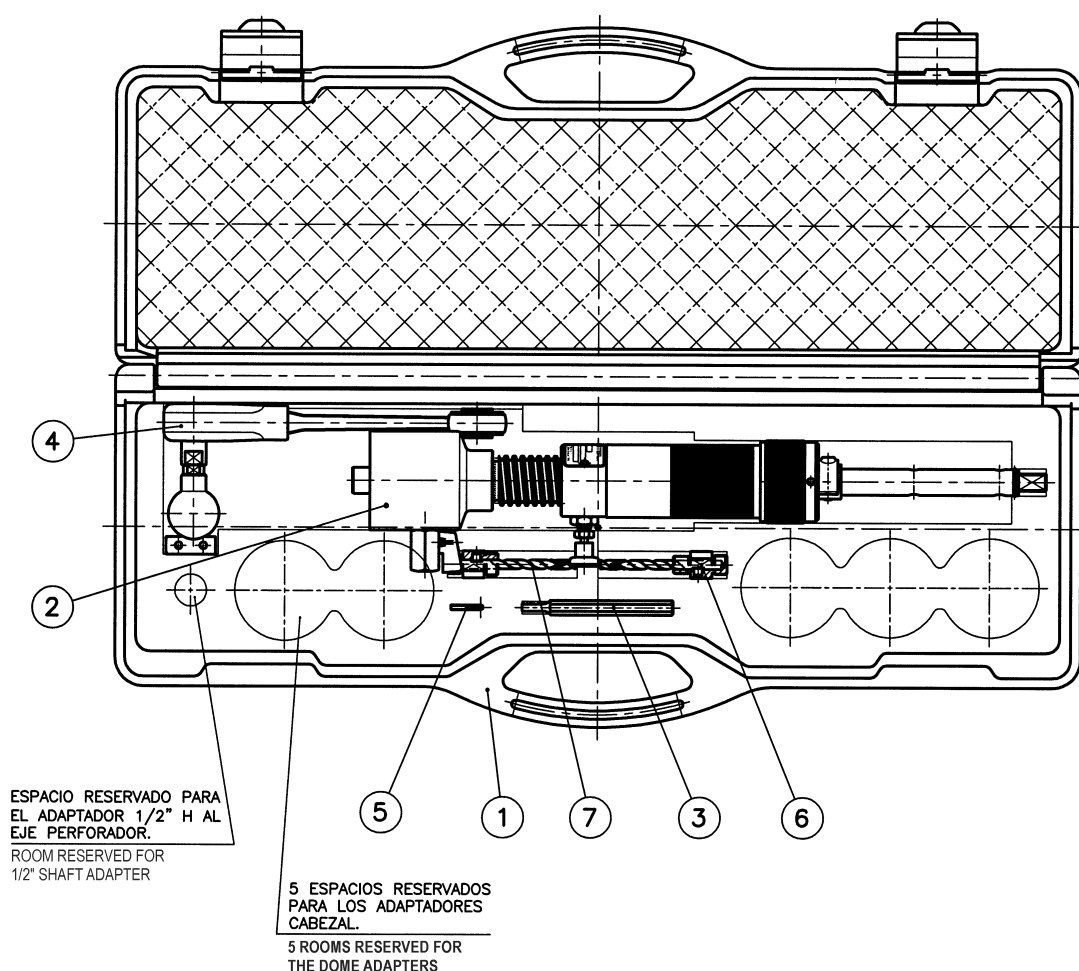


Figure 1

- 1 Carrying case with die cut foam
- 2 Drilling machine
- 3 Dome adapter spanner
- 4 Ratchet wrench with revolving handle
- 5 3mm Allen key
- 6 Arbor hole saws (14 to 30 mm) featuring pilot drill with coupon retainer
- 7 Arbor hole saws (32 to 46 mm) featuring pilot drill with coupon retainer

Main parts of the *AcuDrill* drilling machine:

- 1 Dome with spindle
2" BSP threaded with inner O-ring to screw threaded adapters of the saddle or accessory to be drilled.
- 2 Venting valve
PN16 valve for depressurizing and pressurizing test operations.
- 3 Machine body
Includes end travel mechanism and absorbing mechanism to optimize drilling power.
- 4 **CE** identification plate
Marking pursuant to Machinery Safety Directive.
- 5 End travel mechanism
Blocks the machine's end travel but allows a manual release through the retractable handle.
- 6 Chuckshaft
Features three fastening openings to select the most appropriate length for drilling.
- 7 Chuckshaft fastening bush
This is the element that joins the chuckshaft with the absorbing mechanism. It features a mark indicating the maximum feed limit.
- 8 Chuckshaft fastening mechanism
This allows quick and safe fastening of the chuckshaft to the fastening bush.

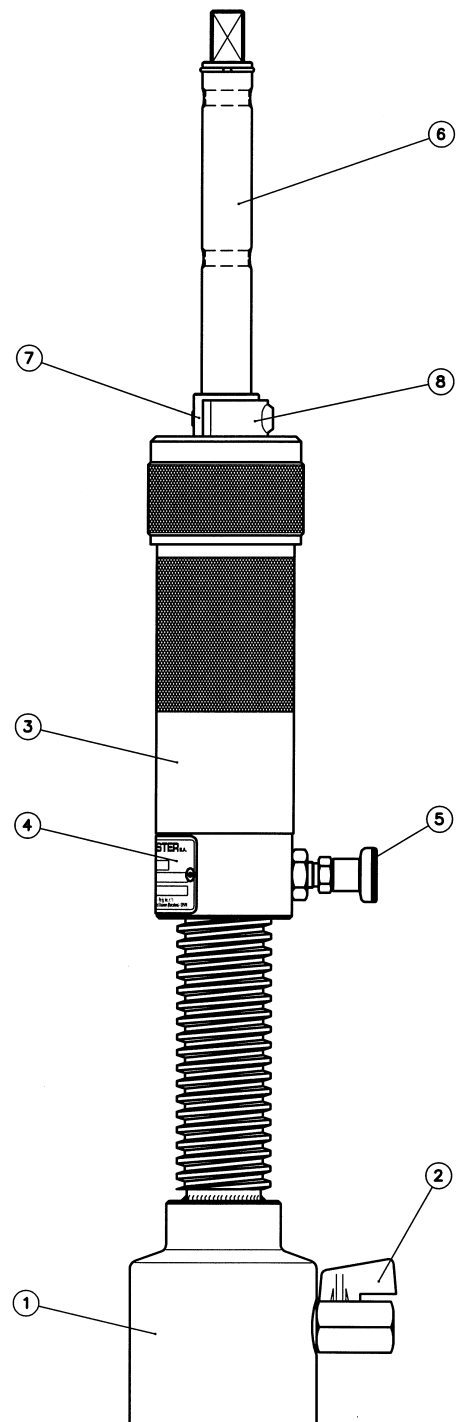


Figure 2

2.2 MACHINE ACCESSORIES

The **AcuDrill** drilling machine also features the following accessories:

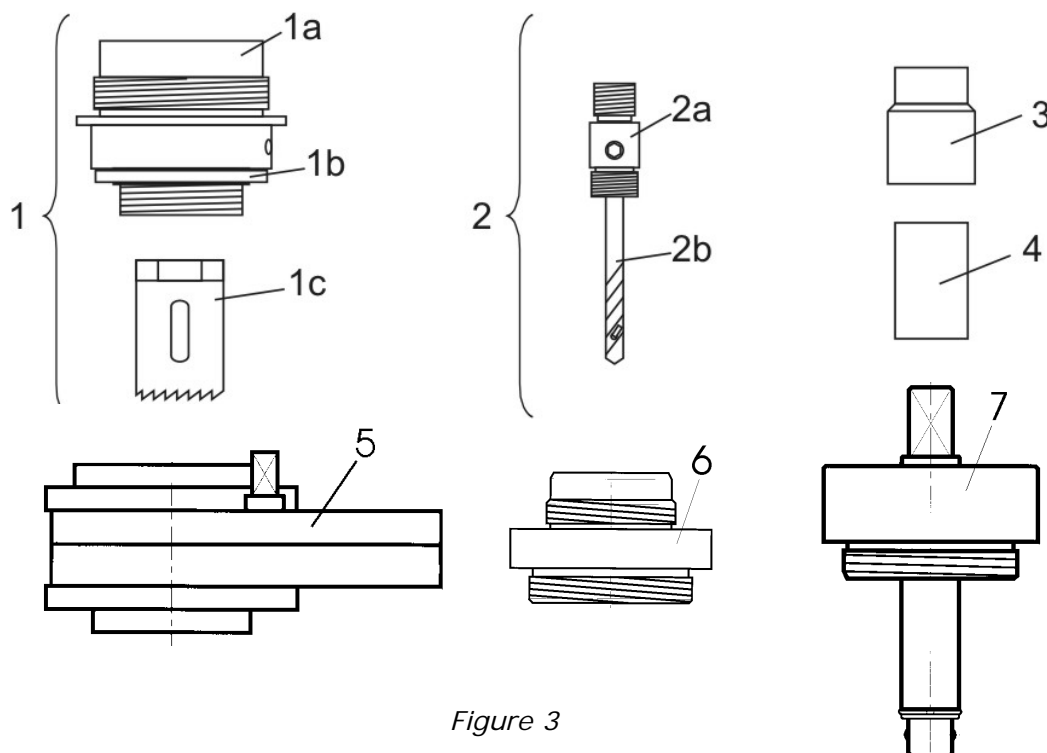


Figure 3

- 1** Saddle adapter kit of 3/4", 1", 1-1/4", 1-1/2" and 2".
 - 1a** Saddle adapter.
 - 1b** Metal-rubber washer.
 - 1c** Variable pitch hole saws of 19, 22, 30, 33 and 46 mm, respectively.
In addition to the hole saws sizes indicated above, other optional sizes can be ordered.
There are special hole saws for drilling PE pipes.
 For additional information, refer to clause 2.3 of this *Manual*.
- 2** 1/2" Arbor hole saw with drill (for hole saws of 14 to 30 mm) and arbor hole saws of 5/8" with drill (for hole saws of 32 to 46 mm).
 - 2a** Arbor hole saws without drill.
 - 2b** Pilot drill of 6.5 mm diameter, with coupon retainer.
- 3** Chuckshaft adapter to an electric drilling machine. Two options: 1) female square drive of 1/2" x 1/2" thread and 2) female square drive of 1/2" x 5/8" thread.
- 4** Chuckshaft adapter to pneumatic machine. Female square drive of 1/2".
- 5** 2 1/2" sandwich valve with 1 1/2" and 2" adapters for 3-way tees and TOR-threaded O-rings.
- 6** 2"-2 1/2" drilling machine dome-sandwich valve adapter.
- 7** Tool for inside plug installation.

2.3 HOLE SAW DIAMETERS AND CHARACTERISTICS FOR ACUDRILL & ACUDRILL PLUS

| ADAPTER SIZE | ADAPTER INSIDE DIAMETER | HOLE SAW DIAMETER (MAX*) | | | | APPLICATION |
|--|-------------------------|--|-----------------------|----------------|-------------------|------------------------|
| | | Bi-metal HSS | Tungsten Carbide Grit | Carbide Tipped | For plastic pipes | |
| 3/4" | 20 | 19 | 19 | 19 | 19 | AcuDrill |
| 1" | 245 | 22 | 22 | 22 | 22 | AcuDrill |
| 1¼" | 325 | 30 | 29 | 30 | 29 | AcuDrill |
| 1½" | 375 | 33 | 32 | 33 | 35 | AcuDrill |
| 2" | 49 | 46 | 44 | 46 | 48 | AcuDrill+Acudrill Plus |
| 2½" | 65 | 60 | 60 | 60 | 60 | AcuDrill Plus |
| 3" | 78 | 76 | 76 | 75 | 76 | AcuDrill Plus |
| DN65/80 | 78 | 60 / 76 | 60 / 76 | 60 / 75 | 62/76 | AcuDrill Plus |
| DN100/125 | 125.8 | 95 / 121 | 95 / 121 | 95 / 121 | 98/114 | AcuDrill Plus |
| DN150 | 160.3 | 146 | 146 | 146 | 133 | AcuDrill Plus |
| DN200 | 184.7 | 177 | 152 | 152 | 160 | AcuDrill Plus |
| GENERAL CHARACTERISTICS | | | | | | |
| Bi-metal HSS: | | Hole saw made of speed steel type M3. Sizes: from 14 to 210 mm; cutting depth of 35 mm. Long series: request information (cutting depth of 48 mm). Application: standard pipelines made of ductile iron, steel and asbestos cement. | | | | |
| Tungsten carbide grit: | | Hole saw made of tungsten carbide dust. Sizes: from 19 to 152 mm; cutting depth of 38 mm. Application: pipelines made of ductile iron. | | | | |
| Tungsten carbide: | | Hole saw made from tungsten carbide tooth welded on a solid body of special steel. Sizes: from 19 to 152 mm; cutting depth of 38 mm. Application: pipelines made of ductile iron and steel. | | | | |
| For plastic pipes: | | Hole saw made of tungsten carbide tooth welded on a sheet body. Sizes: from 16 to 210 mm; cutting depth of 50-55 mm. Application: plastic pipelines, such as PE, PP, PVC, etc. | | | | |
| (MAX*) The indicated hole saw diameter is the one recommended based on: <ul style="list-style-type: none">• Available diameters according to the hole saw supplier.• Maximum diameter depending on the drilling machine adapter used.• Maximum diameter depending on the saddle, T-clamp, valve (full bore), connecting accessories, etc., of the DN used. | | | | | | |

SECTION 3: MODE OF OPERATION

3.1 DRILLING UNDER PRESSURE OVER ACUSTOP-R BRANCH CONNECTIONS

3.1.1 Initial operations:

Before performing the drilling operations, ensure that you have all the necessary material and that it is in good condition.

- Complete drilling machine.
- Arbor hole saw (with pilot drill installed) matching the size of the hole saw to be used.
- Hole saw of the diameter to be used.
- Adapter (with washer) of the diameter of the thread matching the saddle to be installed.
- Tools: 3 mm Allen key, adapter spanner, 17 mm open-end spanner, ½" ratchet wrench (manual drilling) and electrical or pneumatic swivel gear with chuckshaft adaptation elements (if applicable).

3.1.2 Branch connection installation:

The installation of the **AcuStop-R** branch connection is performed placing the saddle and sealing gasket on the pipe. Next, fasten the clamp between the saddle and mains (the hinge joints should remain above the saddle), equally tightening the two fastening bolts to ensure tightness.



For more information, refer to the Fitting Instructions included with the accessory.

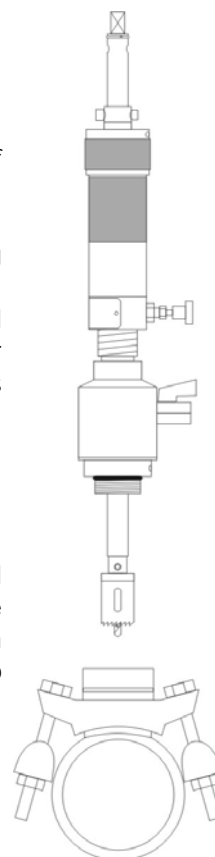


Figure 4

3.1.3 Assembly of the drilling machine:

- Set up the arbor hole saws with the pilot drill in the chuckshaft. Screw the hole saw matching the threaded outlet of the branch connection into the arbor hole saw. See *Figure 5*.
- Choose the adapter that matches the thread of the saddle and screw it into the machine dome. See *Figure 6*.



This operation can be performed manually. If necessary, use the dome adapter spanner included with the equipment.

- For this type of branch connection, position the retention mechanism in the lowest of the three anchoring openings on the chuckshaft. See *Figure 7*.

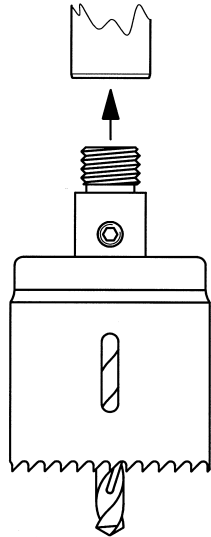


Figure 5

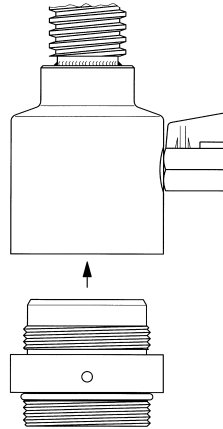


Figure 6

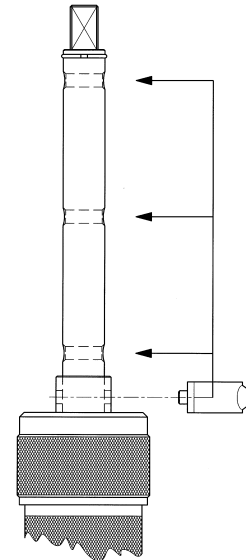


Figure 7

- Place the body of the machine in its upper position (unscrew it until the end travel mechanism is released). Now install the **AcuDrill** drilling machine by screwing it onto the saddle of the branch connection. The adapter must have the washer installed.



WARNING !

If the support face of the saddle is not flat enough, apply Teflon tape to the adapter thread to achieve tightness.

Manually tighten the machine body. If necessary, retighten using the dome adapter spanner included with the equipment.

3.1.4 Pressure test:

Once the drilling machine set and accessories are installed on the saddle of the branch connection, perform a pressure test. To do so, apply compressed air through the venting valve to check tightness of the assembly (see *Figure 8*).

Once the interior is pressurized, and with the venting valve closed, check for leaks in the threaded connections or the gasket at the mains head seat gasket using a spray detector or soapy water. Correct in case of leaks.

Once the check is complete, open the venting valve to depressurize, then leaving it in the "closed" position.

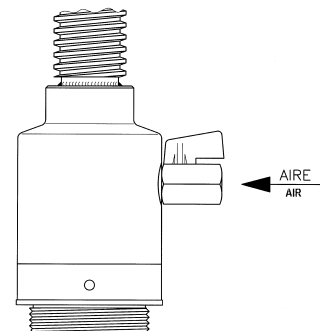


Figure 8

3.1.5 Drilling the mains:

Once the pressure test is complete, lower the chuckshaft by rotating the machine body (with your hand in the knurled area), until the pilot drill makes contact with the pipe (the chuckshaft will have risen depending on the contact force: see measurement **a** of *Figure 9*). At this point, withdraw the tip of the drill from the pipe by approximately one turn. Now begin drilling the mains by activating the chuckshaft using the ratchet wrench, if drilling is manual, or through the electrical or pneumatic swivel gear.



SWIVEL GEAR

If an electrical actuation swivel gear (drilling machine) or pneumatic swivel gear (pneumatic, non-impact tool) is used, the following considerations must be taken into account:

- The rotation speed must be that indicated by the hole saw manufacturer.
- The adapter components may be supplied by Acuster, SL.
- The usage and safety recommendations given by the manufacturer must be followed.

The feed is achieved by making the machine body rotate (with the hand placed in the knurled area). The recommended distance produced by the feed is $a = 1$ or 2 mm (see *Figure 9*) when drilling with the pilot drill. Once perforated with the drill, remember that distance **a** will be increased by the internal driving pressure. The feed limit is indicated by a mechanized line on the fastening bush shaft. If due to an excess of compression (feed + internal pressure) this line becomes visible (see *Figure 9*), turn slightly in the opposite direction to return to the previously-recommended distance.

Ensure that the drilling is complete by making one or two additional turns.

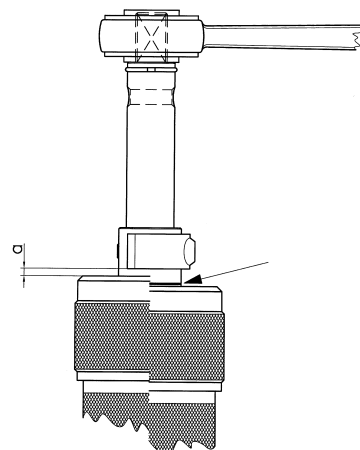


Figure 9



WARNING !

It is recommended to avoid excess feed, especially in the pilot drill work phase, given that the drill could break specially at low revolutions.

3.1.6 Plugging the branch connection:

Once the mains has been perforated, move the chuckshaft up by turning the machine body counterclockwise until the hole saw is positioned in the upper part of the dome. Carefully open the venting valve to remove chip residues. Next, close the valve again. Now carry out the plugging to facilitate disassembly of the machine and the subsequent connection to the branch connection.

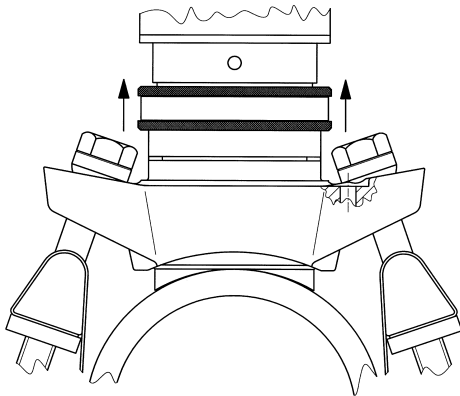


Figure 10



Figure 11

To do so, the slot in the saddle for the introduction of the spatula must be fully accessible. Slightly raise the clamp-gasket assembly of the saddle closure to keep it from interfering with the handle of the spatula during the introduction. See *Figure 10*.



The clamp-gasket assembly is delivered flush with the upper face of the saddle and with the fastening bolt untightened.

Place the pivoting shaft of the spatula in the opening of the saddle (use the small spatula to plug branch connections with threaded outlets of 3/4" to 1 1/2" and the large spatula for branch connections with 2" threaded outlet). Insert the spatula all the way to the bottom through the slot of the saddle. See *Figure 11*.

3.1.7 Disassembly of the machine and accessories:

Before carrying out the disassembly of the drilling machine, check the tightness of the spatula by opening the venting valve. There should not be any fluid overflow, unless it is the amount remaining in the interior before fitting the spatula. Correct the position of the spatula in case of leak or determine the causes of any possible loss.

Once the check is complete, return the venting valve to the closed position.

Disassemble the saddle adapter and drilling machine using the spanner designed for this purpose.

The coupon resulting from drilling the main will have remained trapped by the pilot drill's coupon retainer mechanism. To extract the coupon, disassemble the drill by loosening the Allen fastening stud. Remove the coupon through the upper part of the drill and fit it to the arbor hole saw again. See *Figure 12*.

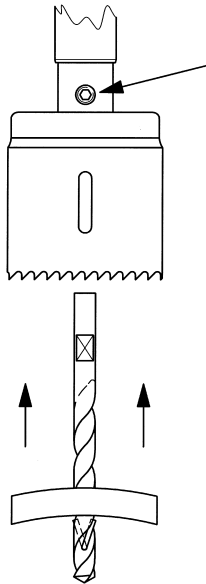


Figure 12

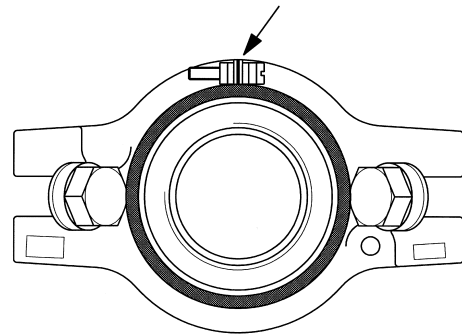


Figure 13

3.1.8 Connecting the branch connection:

Make the proper connections at the threaded outlet of the saddle. If necessary, perform a pressure test on the new section. Completely withdraw the spatula (to allow fluid flow). Next slide the exterior clamp-gasket assembly all the way down. Tighten the fastening bolt of the exterior clamp-gasket assembly to its end travel. See *Figure 13*.



The tightening bolt must remain positioned on the opposite side from the spatula insertion slot, as it is delivered stock.

Retighten the fastening bolts of the branch connection.

3.2 PRESSURELESS DRILLING OVER **CA-R** BRANCH CONNECTIONS

3.2.1 Initial operations:

Before performing the drilling operations, ensure that you have all the necessary material and that it is in good condition.

- Complete drilling machine.
- Arbor hole saw (with pilot drill installed) matching the size of the hole saw to be used.
- Hole saw of the diameter to be used.
- Adapter (with washer) of the diameter of the thread matching the saddle to be installed.
- Tools: 3 mm Allen key, adapter spanner, 17mm open-end spanner, ½" ratchet wrench (manual drilling) and electrical or pneumatic swivel gear with chuckshaft adaptation elements (if applicable).

3.2.2 Branch connection installation:

The installation of the **CA-R** branch connection is performed placing the saddle and gasket on the pipe. Next, fasten the clamp between the saddle and mains (the hinge joints should remain above the saddle), equally tightening the two fastening bolts to ensure tightness.



For more information, refer to the Fitting Instructions included with the accessory.

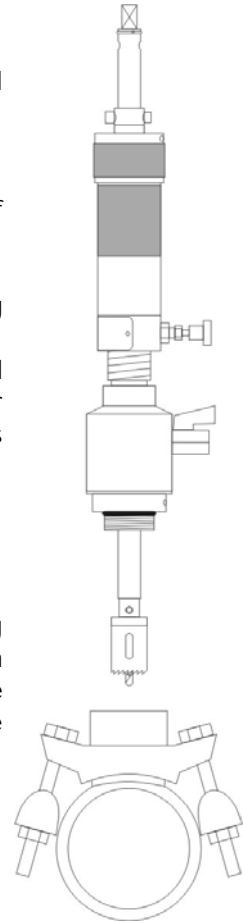


Figure 14

3.2.3 Assembly of the drilling machine:

- Set up the arbor hole saws with the pilot drill in the chuckshaft. Screw the hole saw matching the threaded outlet of the branch connection into the arbor hole saw. See Figure 15.
- Choose the adapter that matches the thread of the saddle and screw it into the machine dome. See Figure 16.



This operation can be performed manually. If necessary, use the dome adapter spanner included with the equipment.

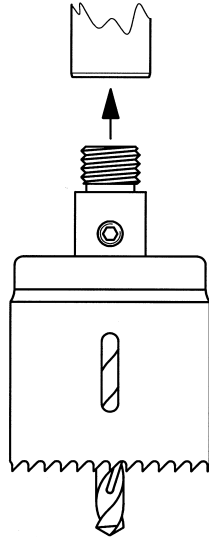


Figure 15

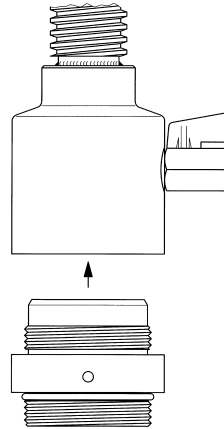


Figure 16

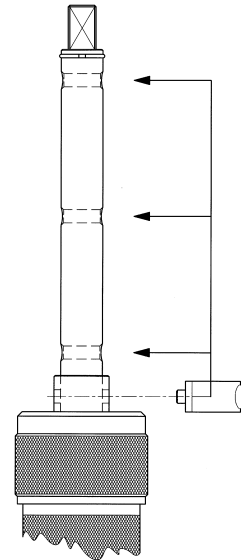


Figure 17

- For this type of branch connection and intervention, position the retention mechanism in the lowest of the three anchoring openings on the chuckshaft. See *Figure 17*.
- Place the body of the machine in its upper position (unscrew it until the end travel mechanism is released). Now install the **AcuDrill** drilling machine screwing it onto the saddle of the branch connection. The adapter must have the washer installed.



WARNING !

If the support face of the saddle is not flat enough, apply Teflon tape to the adapter thread to achieve tightness.

Manually tighten the machine body. If necessary, retighten using the dome adapter spanner included with the equipment.

3.2.4 Drilling the mains:

Once the machine set and saddle accessories are assembled, lower the chuckshaft by rotating the machine body (with your hand in the knurled area), until the pilot drill makes contact with the pipe (the chuckshaft will have risen depending on the contact force: see measurement **a** of *Figure 18*). At this point, withdraw the tip of the drill from the pipe by approximately one turn.

Now begin drilling the mains by activating the chuckshaft using the ratchet wrench, if drilling is manual, or through the electrical or pneumatic swivel gear.



SWIVEL GEAR

If an electrical actuation swivel gear (drilling machine) or pneumatic swivel gear (pneumatic, non-impact tool) is used, the following considerations must be taken into account:

- The rotation speed must be that indicated by the hole saw manufacturer.
- The adapter components may be supplied by Acuster, S.L.
- The usage and safety recommendations given by the manufacturer must be followed.

The feed is achieved by making the machine body rotate (with the hand placed in the knurled area). The recommended distance produced by the feed is $a = 1$ or 2 mm (see *Figure 18*). The feed limit is indicated by a mechanized line on the fastening bush shaft. If due to an excess of compression (feed + internal pressure) this line becomes visible (see *Figure 18*), turn slightly in the opposite direction to return to the previously-recommended distance.



WARNING !

It is recommended to avoid excess feed, especially in the pilot drill work phase, given that the drill could break specially at low revolutions.

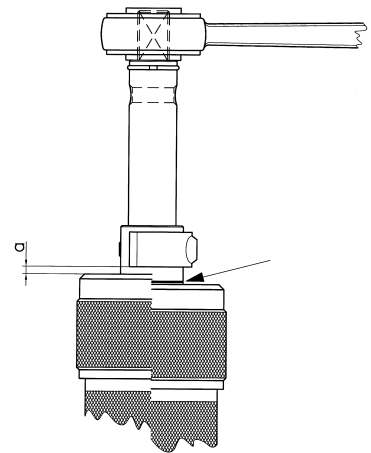


Figure 18

3.2.5 Disassembly of the machine and accessories:

Once the mains has been perforated, move the chuckshaft up by turning the machine body counterclockwise.

Disassemble the saddle adapter and drilling machine using the spanner designed for this purpose.

The coupon resulting from drilling the main will have remained trapped by the pilot drill's coupon retainer mechanism. To extract the coupon, disassemble the drill by loosening the Allen fastening stud. Remove the coupon through the upper part of the drill and fit it to the arbor hole saw again. See *Figure 19*.



WARNING !

Do not touch the coupon following drilling, especially if an electrical or pneumatic swivel gear has been used. Hot surfaces.

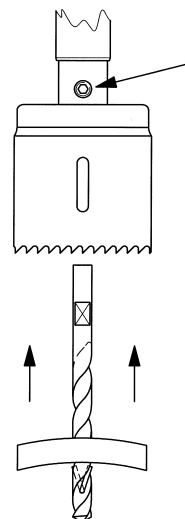


Figure 19

3.2.6 Connecting the branch connection:

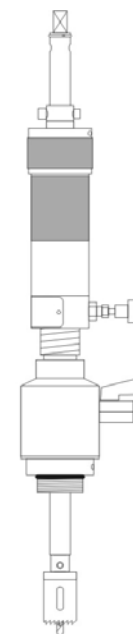
Connect the branch connection to the threaded outlet of the saddle. Retighten the branch connection fasteners.

3.3 DRILLING UNDER PRESSURE OVER **CA-R** BRANCH CONNECTIONS

3.3.1 Initial operations:

Before performing the drilling operations, ensure that you have all the necessary material and that it is in good condition.

- Complete drilling machine.
- Arbor hole saw (with pilot drill installed) matching the size of the hole saw to be used.
- Hole saw of the diameter to be used.
- Adapter (with washer) of the diameter of the thread matching the saddle to be installed.
- Intermediate full bore valve, of the size corresponding to the saddle's threaded outlet. Adapter fitting (if necessary).
- Tools: 3 mm Allen key, adapter spanner, 17 mm open-end spanner, ½" ratchet wrench (manual drilling) and electrical or pneumatic swivel gear with chuckshaft adaptation elements (if applicable).



3.3.2 Branch connection installation:

The installation of the **CA-R** branch connection is performed placing the saddle and gasket on the pipe. Next, fasten the clamp between the saddle and mains (the hinge joints should remain above the saddle), equally tightening the two fastening bolts to ensure tightness.



For more information, refer to the Fitting Instructions included with the accessory.

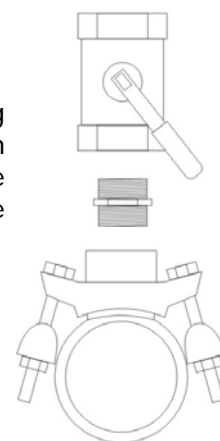


Figure 20

3.3.3 Assembly of the cutoff valve:

Install an intermediate valve (not supplied with the equipment). Screw it directly (or through an adapter fitting) over the **CA-R** branch connection previously installed on the line. Put the valve actuation lever in OPEN position.



WARNING !

The total height (**h**) of the branch connection saddle + selected intermediate valve and fitting (once assembled) must not exceed 210 mm. See Figure 21.

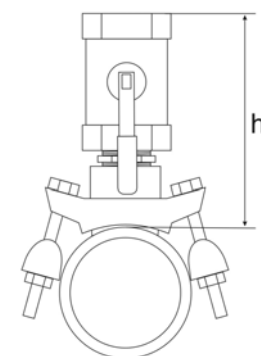


Figure 21

3.3.4 Assembly of the drilling machine:

- Set up the arbor hole saws with the pilot drill in the chuckshaft. Screw the hole saw matching the threaded outlet of the branch connection into the arbor hole saw. See *Figure 22*.
- Choose the adapter that matches the thread of the saddle and screw it into the machine dome. See *Figure 23*.



This operation can be performed manually. If necessary, use the dome adapter spanner included with the equipment.

- Select the position of the chuckshaft depending on the distance it will have to travel during drilling, placing the retention mechanism in the most appropriate opening of the three located on the shaft. See *Figure 24*.

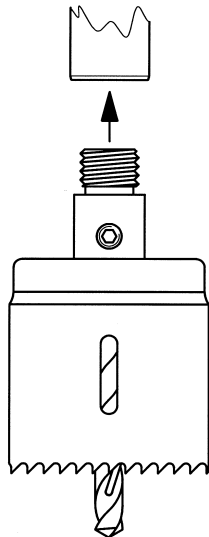


Figure 22

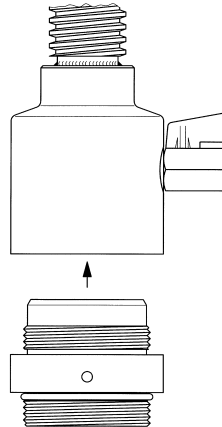


Figure 23

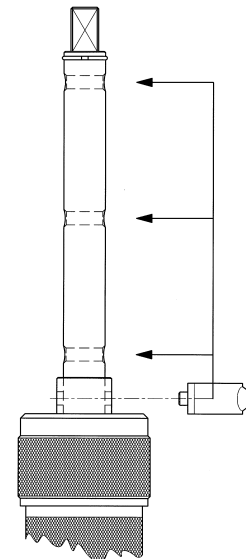


Figure 24

- Place the body of the machine in its upper position (unscrew it until the end travel mechanism is released). With the control mechanism of the intermediate valve in open position, now assemble the **AcuDrill** drilling machine, screwing it onto the valve installed over the saddle of the branch connection. The adapter must have the washer installed.



WARNING !

If the support face of the intermediate valve is not flat enough, apply Teflon tape to the adapter thread to achieve tightness.

Manually tighten the machine body. If necessary, retighten using the dome adapter spanner included with the equipment.

3.3.5 Pressure test:

Once the drilling machine set and accessories are installed on the intermediate valve, perform a pressure test.

To do so, apply compressed air through the venting valve to check tightness of the assembly (see *Figure 25*).

Once the interior is pressurized, and with the venting valve closed, check for leaks in the threaded connections or the gasket at the mains head seat gasket using a spray detector or soapy water. Correct in case of leaks.

Once the check is complete, open the venting valve to depressurize, then leaving it in the "closed" position.

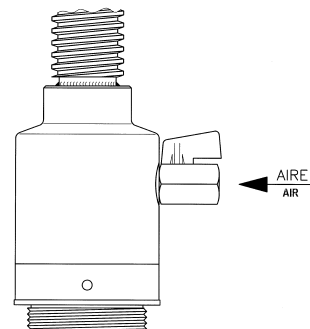


Figure 25

3.3.6 Drilling the mains:

Once the pressure test is complete, lower the chuckshaft by rotating the machine body (with your hand in the knurled area), until the pilot drill makes contact with the pipe (the chuckshaft will have risen depending on the contact force: see measurement **a** of *Figure 26*). At this point, withdraw the tip of the drill from the pipe by approximately one turn. Now begin drilling the mains by activating the chuckshaft using the ratchet wrench, if drilling is manual, or through the electrical or pneumatic swivel gear.



SWIVEL GEAR

If an electrical actuation swivel gear (drilling machine) or pneumatic swivel gear (pneumatic, non-impact tool) is used, the following considerations must be taken into account:

- The rotation speed must be that indicated by the hole saw manufacturer.
- The adapter components may be supplied by Acuster, S.L.
- The usage and safety recommendations given by the manufacturer must be followed.

Feed is achieved by making the machine body rotate (with the hand placed in the knurled area). The recommended distance produced by the feed is $a = 1$ or 2 mm (see *Figure 26*) when drilling with the pilot drill. Once perforated with the drill, remember that distance **a** will be increased by the internal driving pressure. The feed limit is indicated by a mechanized line on the fastening bush shaft. If due to an excess of compression (feed + internal pressure) this line becomes visible (see *Figure 26*), turn slightly in the opposite direction to return to the previously-recommended distance. Ensure that the drilling is complete by making one or two additional turns.

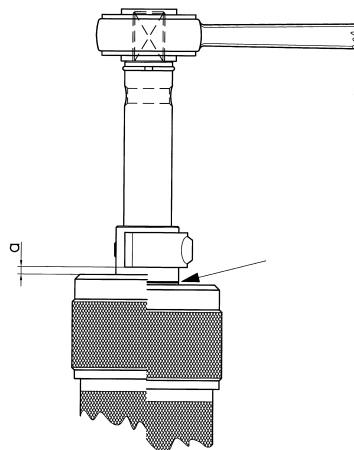


Figure 26



WARNING !

It is recommended to avoid excess feed, especially in the pilot drill work phase, given that the drill could break specially at low revolutions.

If a length longer than the machine's travel is necessary, the drilling can be continued by moving the retention mechanism to the next opening above the one it was fastened to on the shaft (unless the highest anchoring has been in use). See *Figure 24*.

3.3.7 Disassembly of the machine and accessories:

Once the mains has been perforated, move the chuckshaft up by turning the machine body counterclockwise until the end travel mechanism is activated.

Continue withdrawing the chuckshaft by pulling the retention mechanism out of the opening where it is located. To do so, first place the ratchet wrench on the end shaft ½" square and push down to facilitate the retention mechanism removal. Then, take control with the ratchet wrench of the moving up of the chuckshaft due to the pipeline pressure (refer to *Figure 27*). The chuckshaft will fully rise until the hole saw is positioned on the upper part of the dome.

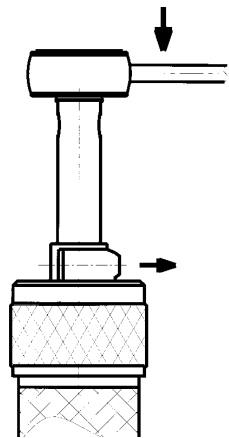


Figure 27



WARNING !

Due to pipeline internal pressure the chuckshaft will be moved upwards. Take the necessary safety cautions to avoid any sort of accident during this operation.

Carefully open the venting valve to remove chip residues. Next, close the valve again.

Then switch the intermediate valve to the CLOSED position.

Disassemble the saddle adapter and drilling machine using the spanner designed for this purpose.

The coupon resulting from drilling the mains will have remained trapped by the pilot drill's coupon retainer mechanism. To extract the coupon, disassemble the drill by loosening the Allen fastening stud. Remove the coupon through the upper part of the drill and fit it to the arbor hole saw again. See *Figure 28*.

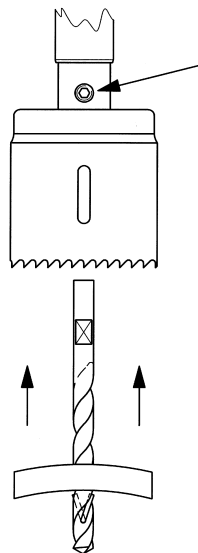


Figure 28

3.3.8 Connecting the branch connection:

Connect the branch connection to the appropriate outlet for the intermediate valve. Retighten the branch connection fasteners.

3.4 PRESSURELESS DRILLING OVER **ACUFLEX** BRANCH CONNECTIONS

3.4.1 Initial operations:

Before performing the drilling operations, ensure that you have all the necessary material and that it is in good condition.

- Complete drilling machine.
- Arbor hole saw (with pilot drill installed) matching the size of the hole saw to be used.
- Hole saw of the diameter to be used.
- Adapter (with washer) of the diameter of the thread matching the saddle to be installed.
- Tools: 3 mm Allen key, adapter spanner, 17 mm open-end spanner, ½" ratchet wrench (manual drilling) and electrical or pneumatic swivel gear with chuckshaft adaptation elements (if applicable).

3.4.2 Branch connection installation:

Installation of the **ACUFLEX** branch connection is performed by placing the threaded outlet in the opening of the upper sector. Next, set the upper sector and inferior sector through the hinge mechanism they are equipped with and place them over the mains, in the desired position and orientation. Tighten the two fastening bolts to ensure tightness.



For more information, refer to the Fitting Instructions included with the accessory.

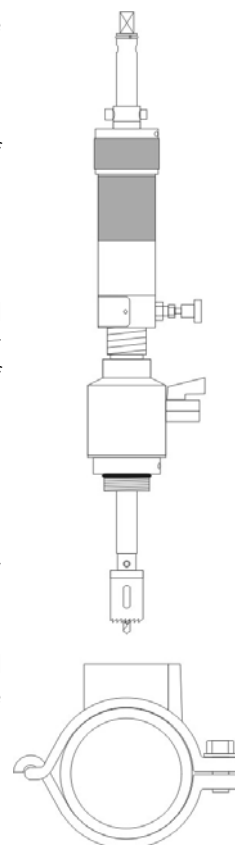


Figure 29

3.4.3 Drilling machine assembly:

- Set up the arbor hole saws with the pilot drill in the chuckshaft. Screw the hole saw matching the threaded outlet of the branch connection into the arbor hole saw. See *Figure 30*.
- Choose the adapter that matches the thread of the saddle and screw it into the machine dome. See *Figure 31*.



This can be performed manually. If necessary, use the dome adapter spanner included with the equipment.

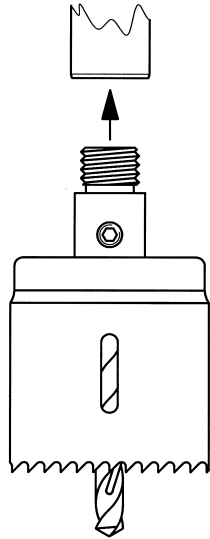


Figure 30

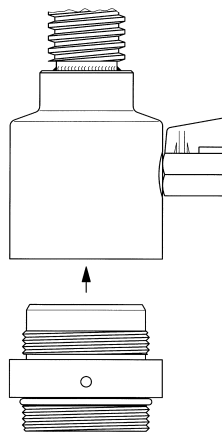


Figure 31

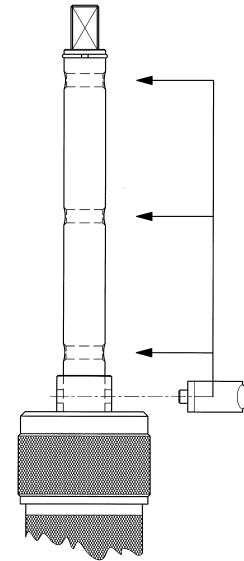


Figure 32

- For this type of branch connection and intervention, position the retention mechanism in the first (lowest) of the three anchoring openings on the chuckshaft. See *Figure 32*.
- Place the body of the machine in its upper position (unscrew it until the end travel mechanism is released). Now install the **AcuDrill** drilling machine screwing it onto the saddle of the branch connection. The adapter must have the washer installed.



WARNING !

If the support face of the saddle is not flat enough, apply Teflon tape to the adapter thread to achieve tightness.

Manually tighten the machine body. If necessary, retighten using the dome adapter spanner included with the equipment.

3.4.4 Drilling the mains:

Once the machine set and saddle accessories are assembled, lower the chuckshaft by rotating the machine body (with your hand in the knurled area), until the pilot drill makes contact with the pipe (the chuckshaft will have risen depending on the contact force: see measurement **a** of *Figure 33*). At this point, withdraw the tip of the drill from the pipe by approximately one turn.

Now begin drilling the mains by activating the chuckshaft using the ratchet wrench, if drilling is manual, or through the electrical or pneumatic swivel gear.



SWIVEL GEAR

If an electrical actuation swivel gear (drilling machine) or pneumatic swivel gear (pneumatic, non-impact tool) is used, the following considerations must be taken into account:

- The rotation speed must be that indicated by the hole saw manufacturer.
- The adapter components may be supplied by Acuster, S.L.
- The usage and safety recommendations given by the manufacturer must be followed.

The feed is achieved by making the machine body rotate (with the hand placed in the knurled area). The recommended distance produced by the feed is $a = 1$ or 2 mm (see *Figure 33*). The feed limit is indicated by a mechanized line on the fastening bush shaft. If due to an excess of compression (feed + internal pressure) this line becomes visible (see *Figure 33*), turn slightly in the opposite direction to return to the previously-recommended distance.



WARNING !

It is recommended to avoid excess feed, especially in the pilot drill work phase, given that the drill could break specially at low revolutions.

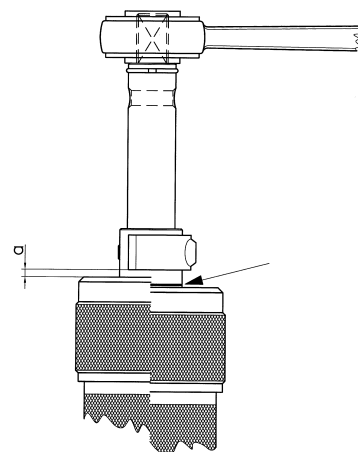


Figure 33

3.4.5 Disassembly of the machine and accessories:

Once the mains has been perforated, move the chuckshaft up by turning the machine body counterclockwise.

Disassemble the saddle adapter and drilling machine using the spanner designed for this purpose.

The coupon resulting from drilling the mains will have remained trapped by the pilot drill's coupon retainer mechanism. To extract the coupon, disassemble the drill by loosening the Allen fastening stud. Remove the coupon through the upper part of the drill and fit it to the arbor hole saw again. See *Figure 34*.



WARNING !

Do not touch the coupon following drilling, especially if an electrical or pneumatic swivel gear has been used. Hot surfaces.

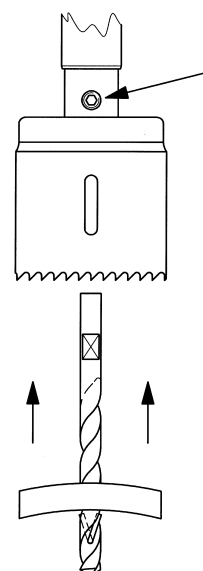


Figure 34

3.4.6 Connecting the branch connection:

Connect the branch connection to the threaded outlet of the saddle. Retighten the fasteners.

3.5 DRILLING UNDER PRESSURE OVER STEEL FITTINGS FOR GAS PIPELINES: 3-WAY TEES AND THREADED O-RINGS OF 1½" - 2"

3.5.1 Initial operations:

Before performing the drilling operations, ensure that you have all the necessary material and that it is in good condition.

- Complete drilling machine.
- Arbor hole saw (with pilot drill installed) matching the size of the hole saw to be used.
- Hole saw of the diameter to be used.
- Drilling machine dome-sandwich valve adapter.
- Sandwich valve with adapter to the fitting thread (1½" or 2").
- Tool for internal plug installation.
- Tools: 3 mm Allen key, adapter spanner, 17 mm open-end spanner, ½" ratchet wrench (manual drilling) and pneumatic swivel gear with chuckshaft adaptation elements (if applicable).

3.5.2 Fitting installation:

Install the steel fitting (3-way tee or TOR-threaded O-ring) following the procedure established by the Gas Company.



It is recommended to remove the exterior plug but keep the internal plug (without o-ring) fitted in position during the fitting preparation and welding. Once the welds cool, remove the internal plug and install its O-ring.

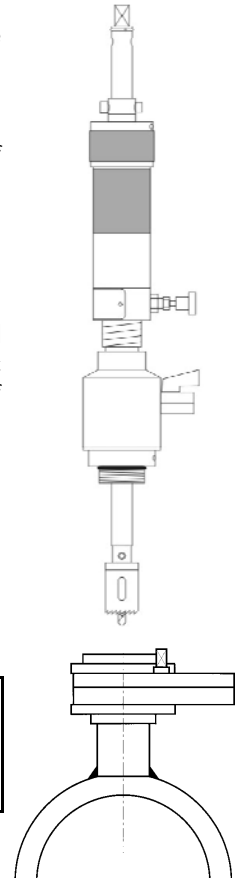


Figure 35

3.5.3 Sandwich valve installation:

- Remove the grease from the fitting internal thread.



WARNING !

Use Teflon® tape of equivalent to the sandwich valve adapter thread to achieve tightness. Check good condition of the upper and lower sandwich valve O-rings.

- Install the 2½" sandwich valve with the adapter corresponding the fitting thread size (1½" or 2"). See *Figure 35*. The sandwich valve gate shall be in OPEN position.

3.5.4 Assembly of the drilling machine:

- Set up the arbor hole saws with the pilot drill in the chuckshaft. Screw the hole saw matching the threaded outlet of the branch connection into the arbor hole saw. See *Figure 36*.

- Screw in the sandwich valve adapter to the drilling machine dome. See *Figure 37*.



This operation can be performed manually. If necessary, use the dome adapter spanner included with the equipment.

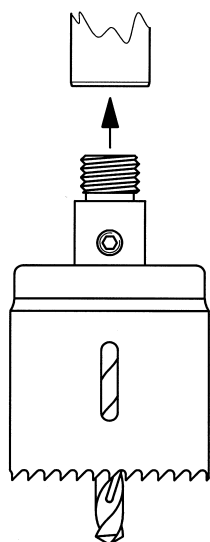


Figure 36

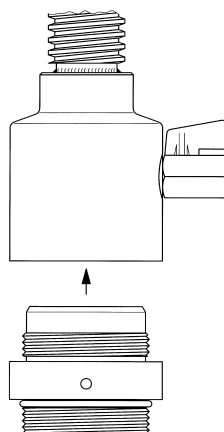


Figure 37

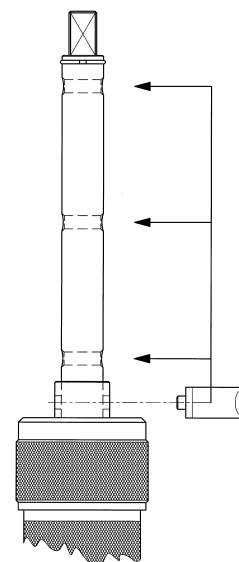


Figure 38

- Select the position of the chuckshaft depending on the distance it will have to travel during drilling, placing the retention mechanism in the most appropriate opening of the three located on the shaft (middle orifice for 2" TOR and upper orifice for 1½" and 2" 3-way tees). See *Figure 38*.
- Place the body of the machine in its upper position (unscrew it until the end travel mechanism is released). Now assemble the **AcuDrill** drilling machine, screwing it onto the sandwich valve installed over the fitting.



WARNING !

Manually tighten the machine body. If necessary, retighten using the dome adapter spanner included with the equipment.

3.5.5 Pressure test:

Once the drilling machine set and accessories are installed on the sandwich valve, perform a pressure test.

To do so, apply compressed air through the venting valve to check tightness of the assembly (see *Figure 39*).

Once the interior is pressurized, and with the venting valve closed, check for leaks in the threaded connections or the gasket at the mains head seat gasket using a spray detector or soapy water. Correct in case of leaks.

Once the check is complete, open the venting valve to depressurize, then leaving it in the "closed" position.

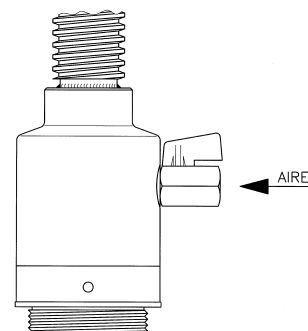


Figure 39

3.5.6 Drilling the mains:

Once the pressure test is complete, lower the chuckshaft by rotating the machine body (with your hand in the knurled area), until the pilot drill makes contact with the pipe (the chuckshaft will have risen depending on the contact force: see measurement **a** of *Figure 40*). At this point, withdraw the tip of the drill from the pipe by approximately one turn. Now begin drilling the mains by activating the chuckshaft using the ratchet wrench, if drilling is manual, or through the pneumatic swivel gear.



SWIVEL GEAR

If a pneumatic swivel gear (pneumatic, non-impact tool) is used, the following considerations must be taken into account:

- The rotation speed must be that indicated by the hole saw manufacturer.
- The adapter components may be supplied by Acuster, SL.
- The usage and safety recommendations given by the manufacturer must be followed.

Feed is achieved by making the machine body rotate (with the hand placed in the knurled area). The recommended distance produced by the feed is $a = 1$ or 2 mm (see *Figure 40*) when drilling with the pilot drill. Once perforated with the drill, remember that distance **a** will be increased by the internal driving pressure. The feed limit is indicated by a mechanized line on the fastening bush shaft. If due to an excess of compression (feed + internal pressure) this line becomes visible (see *Figure 40*), turn slightly in the opposite direction to return to the previously-recommended distance. Ensure that the drilling is complete by making one or two additional turns.



WARNING !

It is recommended to avoid excess feed, especially in the pilot drill work phase, given that the drill could break specially at low revolutions.

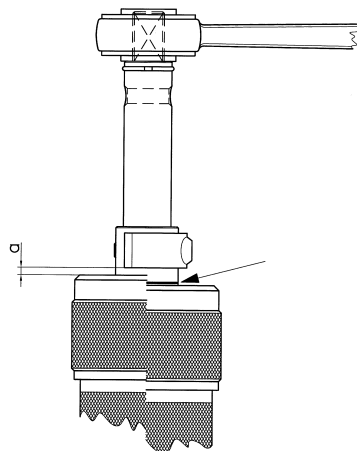


Figure 40

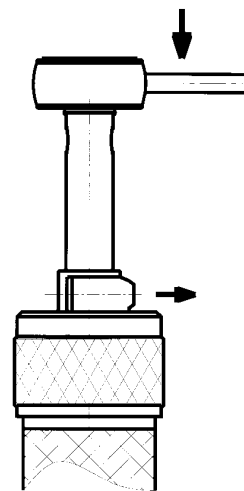


Figure 41

3.5.7 Plugging the fitting:

Once the mains has been perforated, move the chuckshaft up by turning the machine body counterclockwise until the hole saw is positioned in the upper part of the dome. On that position, the chuckshaft does not allow the sandwich valve to be closed. Continue withdrawing the chuckshaft by pulling the retention mechanism out of the opening where it is located. To do so, first place the ratchet wrench on the end shaft ½" square and push down to facilitate the retention mechanism removal. Then, take control with the ratchet wrench of the moving up of the chuckshaft due to pipeline pressure (refer to *Figure 41*). The chuckshaft will fully rise until the hole saw is positioned on the upper part of the dome.



WARNING !

Due to pipeline internal pressure the chuckshaft will be moved upwards. Take the necessary safety cautions to avoid any sort of accident during this operation.

Put in the close position the sandwich valve to allow the disassembling of the drilling machine and later internal plug installation. Carefully open the venting valve to remove chip residues and depressurize.

3.5.8 Disassembly of the machine and accessories:

Before disassembling the drilling machine, check sandwich valve tightness opening the venting valve. No fluid must flow out except the one which remains inside before the sandwich valve closing. Investigate the reason of any suspicious leakage.

Once carried out the above check, close again the venting valve.

Disassemble the drilling machine and its sandwich valve adapter using the spanner designed for this purpose.

The coupon resulting from drilling the mains will have remained trapped by the pilot drill's coupon retainer mechanism. To extract the coupon, disassemble the drill by loosening the Allen fastening stud. Remove the coupon through the upper part of the drill and fit it to the arbor hole saw again. See *Figure 42*.

3.5.9 Installation of the fitting internal plug:

- Fit the fitting internal plug (ensure that the O-ring is fitted) in the plug installation tool.
- Assembly the plug installation tool (with the plug on it) over the sandwich valve. See *Figure 43*.



This operation can be carried out by hand. If necessary, use the dome adapter spanner included with the equipment.

- Open the sandwich valve.
- Move downwards the installation plug tool shaft as far the plug makes contact with the fitting (3-way tee or TOR).

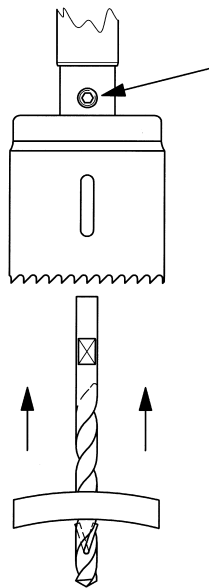


Figure 42

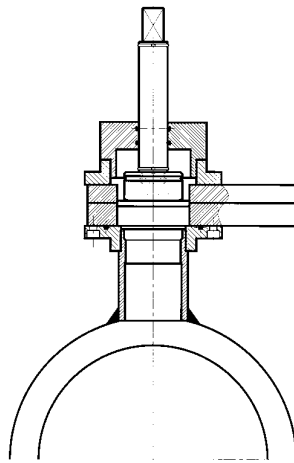


Figure 43

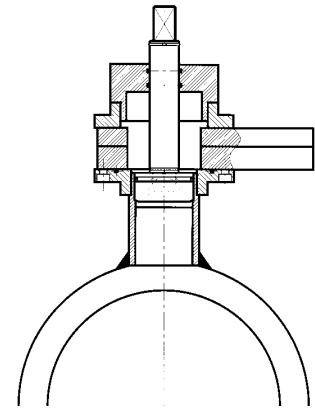


Figure 44

- Once the plug and fitting are in contact, turn the shaft clockwise by means of a 3/4" ratchet wrench, open-end spanner, etc. to screw in the plug into its fitting location. After several turns, the torque resistance will dramatically increase indicating that the plug has completed its screwing travel. See *Figure 44*.
- Move the shaft upwards: pull up without turning.
- Disassembly the plug installation tool and the sandwich valve.
- Install the fitting exterior plug following the Gas Company established procedure.

SECTION 4: MAINTENANCE

4.1 GENERAL INFORMATION

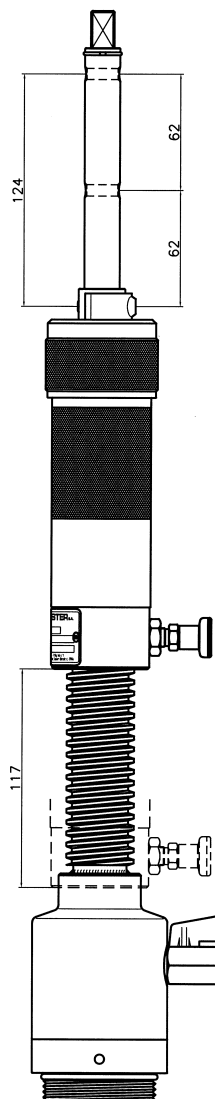
As a general principle, we recommend maintaining the drilling machine (and all components and accessories) in perfect conditions of cleanliness and lubrication, ready for use, and stored in their original carrying case.

The preventive maintenance for the equipment is minimal; cleaning and lubricating the chuckshaft, the spindle threads and machine dome is sufficient. Monitor the cutting condition of the drill and hole saws before usage. It is recommended they be replaced in case of fault.

On a regular basis, and especially when the equipment is used over a prolonged period, we recommend it be sent to the ACUSTER, SL. After-Sales Service Department for a complete inspection (generally, with time and use, the O-rings and gaskets need to be changed).

SECTION 5: TECHNICAL CHARACTERISTICS

| | | |
|----------------------------|---|---|
| Usage: | : | Drilling of mains made of steel, gray cast iron, ductile casting, asbestos cement, clay, polyester, PVC, PE, PP, etc. |
| Acuster branch connections | : | ACUSTOP-R, CA-R and ACUFLEX. |
| Other brands | : | All types of saddles with threaded outlets 3/4", 1", 1-1/4", 1-1/2" and 2" BSP. |
| Fittings for gas | : | 3-way tees and TORs of 1½" and 2". |
| Maximum drilling capacity | : | Up to ϕ . 48 mm |
| Maximum range | : | <div>117 mm from the machine body</div> <div>124 mm from the chuckshaft (moving the fastening openings).</div> <div>241 mm Total, adding range travel and fastening shaft</div> |
| Service pressure | : | <div>16 bar for water mains</div> <div>5 bar for gas mains</div> |
| Operation | : | <div>Manual by means of a ratchet wrench provided with a revolving handle.</div> <div>Optionally by means of an electric or pneumatic-actuated swivel gear.</div> |
| Total equipment weight | : | 6.9 kg (with carrying case and without adapters) |
| Outer dimensions | : | <div>Carrying case:</div> <div>Length: 700 mm</div> <div>Width: 260 mm</div> <div>Height: 105 mm</div> |





Weight of optional components:

| | | |
|-------------------------------------|---|--|
| Kit 3/4" saddle adapter | : | 0.590 Kg |
| Kit 1" saddle adapter | : | 0.555 Kg |
| Kit 1¼" saddle adapter | : | 0.575 Kg |
| Kit 1½" saddle adapter | : | 0.575 Kg |
| Kit 2" saddle adapter | : | 0.640 Kg |
| Dome-sandwich valve adapter | : | 1.110 Kg |
| 2½" sandwich valve w/o adapter | : | 7.395 kg |
| 1½" sandwich valve adapter | : | 0.910 Kg |
| 2" sandwich valve adapter | : | 0.835 Kg |
| Plug installation tool | : | 2.075 Kg |
| Electric propeller (rotary machine) | : | 6.690 Kg (with shaft adapter and transport case) |

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